DOCUMENT RESUME

ED 343 554 IR 015 400

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TITLE The National Research and Education Network: Two Meetings.
PUB DATE 17 Dec 90
NOTE 9p.
PUB TYPE Viewpoints (Opinion/Position Papers, Essays, etc.) (120) -- Reports - Descriptive (141)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Computer Networks; Conferences; Federal Government; *Government Role; Hearings; Higher Education; High Schools; Information Management; *National Programs; Research and Development; *Resource Allocation; Telecommunications
IDENTIFIERS *National Research and Education Network

ABSTRACT

This article discusses two meetings which dealt with developments regarding the National Research and Education Network (NREN). In November 1990, the John F. Kennedy School of Government at Harvard University held a symposium entitled "Information Infrastructure for the 1990s," whose participants represented a wide spectrum of economic, political, and social views. The four primary issues addressed by that symposium were: (1) high-end versus low-end users of a national computer network; (2) development of communications technology versus development of new services; (3) the scope of the network infrastructure; and (4) the management and organization of the national network. Two papers were presented at the symposium: "The Distributed Electronic Library System: Implications for the NREN" (Marvin Sirbu); and "The Digital Library System and Knowbots" (Vint Cerf). A hearing at the Office of Technology Assessment (OTA) in December 1991 focused on the subject of access to the NREN. Speakers included representatives from the Association of Research Libraries, Information International, Apple Computer Library and Engineering Computer Operations, the Coalitions for Networked Information, Old Colorado City Communications, EDUCOM, the legal department of DIALOG, Mead Data Central, the Media Lab at the Massachusetts Institute of Technology, the National Science Foundation, Syracuse University, and various OTA people. Brief examples of their testimony are included in this summary of the hearing. (DB)

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The National Research and Education Network: Two Meetings

by

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December 17, 1990

LR 015 400

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The National Research and Education Network: Two meetings
Steve Cisler, Senior Scientist Apple Computer Library December 17, 1990

For the past few years the higher education community, including many librarians, have been advocating a strong federal role in the funding of a high capacity research and education network. Many programs at the 1990 ALA conference were devoted to this subject, and Meckler Publishing even has a newsletter devoted solely to the topic. For more information see recent LITA Newsletter, EDUCOM Review, or the June 1990, issue of Wilson Library Bulletin. John Markoff frequently writes about this subject in the New York Times. This article discusses two meetings that will be of interest to those of you following the development of the NREN.

At the end of November 1990, the John F. Kennedy School of Government at Harvard University held a workshop/symposium entitled "Information Infrastructure for the 1990s." More than a dozen lengthy papers were mailed to the participants beforehand so that we could prepare for the presentations and discussions that took place. Because there has been so much interest in a high capacity research and education network, the main conference chamber was jammed with more than 100 attendees and organizers, an assortment of audio visual gear, and enormous binders filled with supplementary material from the speakers.

The fees for attendance were high ($750 to $1500) Although at least one of the official presenters did not have to pay, there were people from the non-profit sector who felt the high fees eliminated a certain part of society that included stakeholders in any future telecommunications network. Looking around the room I counted about 15 women, one African-American, and about 90 white guys over forty (me included). I had prepared for this conference by reading the papers carefully, talking with other technical experts at Apple, discussing some of the issues with other librarians from ALA, public libraries, universities, and getting feedback from telecomms activists in the general population. While I could not represent all their views, it helped me to evaluate some of the claims and schemes that were proposed at formal sessions, breakout discussions and during breaks and meals.

Although I may sound critical about the demographics of the group, it represented a wide spectrum of economic, political, and social views on the many issues, and I felt it was an extremely stimulating and important meeting. At one point we used small keypads (a la America's Funniest Home Videos) to vote on issues that had been discussed. We

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could not even agree on the phrasing of some of the questions, but when the answers were displayed on the monitors it showed there was very little consensus. Because the numbers are not hard, I won't quote the exact results. The four most important issues seemed to be (1)the debate over the high-end vs. low-end users; (2)development of communications technology vs. development of new services; (3)the scope of the network infrastructure; and (4) the management and organization of the national network. I'll try to explain some of the positions which are not either-or but are on a sliding scale with proponents at all points.

1) High-end versus low-end user. Two extremes: the theoretical physicist in a small college working a thousand miles from a centrally located Cray or Connection Machine to model weather patterns and create a three-dimensional cloud that can be manipulated in real time and saved as an animation...or...a child in rural Tennessee getting information on dinosaurs from the Library of Congress (Senator Gore's example became a metaphor for the low-end user). Other examples of low-end use would be most electronic mail, file transfers, and remote login to text databases and bibliographic information. Another example of the constituencies at either end: several hundred scientists...or... millions of individuals.

2) Communications versus services. Terrence McGarty of MIT and NYNEX wrote a terrific position paper that helped me look at the future network in a new light. Instead of designing the network based on voice communications technology, employ massive amounts of dark fiber, i.e. optical fiber with no dedicated use, and put all intelligence on the end user, or as a Bell Operating Company would call it, in the customer premises equipment. This is an echo of Peter Huber's work on freeing up the Bell companies to provide information services in "The Geodesic Network"where all the intelligence in on the nodes, and not in the central offices of the phone system. The end-user determines how much bandwidth is needed and for what purpose and is not impeded by phone company governors or slow switches. This probably won't be feasible for five years or so, but Apple's philosophy would probably agree that a network should be designed with that in mind. This is a continuation of the philosophy that provides more and more power in a personal computer or workstation, rather than in a central mainframe located in a university computing center or in a phone company's central office.

3) Scope of the Infrastructure:

There are many issues related to network design, moving gigabits every second, and dealing with high-overhead protocol suites that may

actually impede the networks of the future, and consortia of academic, government, and industry laboratories (coordinated by the Corporation for National Research Initiatives) are working on the so-called 'gigabit testbeds'. It is clear to me that these groups are going to make the network run at much higher capacity, but the manufacturers of the machines are going to design the busses that can handle that much data flowing in through a port, and the software companies will design the tools to massage the data and turn it into information. Two-thirds of the attendees thought more resources should be put into developing services including such software development and the establishment of new information tools, directories, and databases.

Two breakout sessions on the digital library concept were well attended, and the participants in the audience were so enthusiastic that each speaker had some difficulty in getting through his overhead screens.

Marvin Sirbu, Information Networking Institute, Carnegie Mellon University, presented "The Distributed Electronic Library System: Implications for the NREN." He had worked out a rather complete model for an electronic delivery system that would be inexpensive for the scientific community and yet provide royalties to the creators and copyright holders of the technical information (which would be the bulk of the database). It's success is based on a growing base of powerful workstations, but access is provided to people with dumb terminals and fax machines too.

Vint Cerf of the Corporation for National Research Initiatives was visibly excited by Sirbu's work, and he followed the next day with an explanation of the Digital Library System and Knowbots (software agents that are programmed to roam networks and find information in databases that fit the interest profile of a Knowbot 'owner'.) My impression was that the breakout sessions were more focused, attracted communities of interest that were not so diverse as the general sessions, and that people were willing to listen to each other more readily.

4)Management and organization: The two largest clusters of opinion said there should be much more involvement by federal government...or...no involvement at all. The Library and Information Technology Association is preparing a position paper that calls on Congress and the Federal Government to be "a crucial partner with America's libraries in providing for the information needs of its citizenry." (LITA Newsletter, Winter 1991) It's obvious to most of the library community that federal money has provided funds for new

programs and that it could be very beneficial to continue this role with the NREN. However, I did a presentation on information resources on the Internet at the recent Hackers 6.0 conference in Lake Tahoe and found that many of those present held strong libertarian views and would have sided with the contingent at Harvard arguing for no government involvement. Quite a few programmers and network administrators hold these views, even as they use the federally subsidized NSFNet backbone to exchange libertarian viewpoints. Aside from this split, everyone believes this will be a tremendously difficult issue. The disagreements during the three days together will be accentuated in any national forum, but the free-market voices were especially strong considering the present priorities of the government (our deficit, the drug war, and the enormous bill for Desert Shield.)

Given the current climate any new legislation that is introduced may not propose a network that is as all-inclusive as many in the library community would like to see. By early 1991, we will know.

Office of Technology Assessment Hearing: December 11, 1990

The subject of access to the NREN was the focus of a one day hearing in Washington at the Office of Technology Assessment. Gordon Cook, the author of the forthcoming report to Congress, has been hosting a computer conference for the participants as well as some people who were unable to attend the face-to-face meeting. The hearing was open, and several people from the Washington area library community attended. Those speaking included representatives from Association of Research Libraries, Information International, Apple Computer Library and Engineering Computer Operations, Coalition for Networked Information, Old Colorado City Communications, MIT, U. of California Division of Library Automation, LINC Resources, Syracuse University, EDUCOM, the legal department of DIALOG, Mead Data Central, The Media Lab at MIT, NSF, and various OTA people.

Except for a sales pitch by Mead Data Central the rest of us spent 8 minutes apiece making statements about who should have access to the NREN. Here are snippets of the comments. The idea of a privatized network is becoming more popular in some circles despite the high cost of tapping into the network through such systems as ANS, the IBM-Merit-MCI consortium. ANS charges $24,000 per year plus the 56 kb. circuit between the client and the ANS site. Larger pipes (lines with greater capacity) are available.

Stephen Wolff of NSF: Build the network for the top 200+ researchers in the country in the short term, for all educators and related institutions in the medium term,

and for all the public after that (year 2000 and later). The leverage provided to leading edge researchers will give the government a lot of return on their investment.

Pru Adler of Association of Research Libraries thought the federal government has a real role to play in bringing some balance and equity in access. In addition, the government should provide some sort of safety net for users.

Dave Hughes of Old Colorado City Communications in Colorado Springs, gave the equivalent of an "I Have a Dream" speech advocating low cost access for independent researchers, hackers, kids (to prepare them for the future)and to adults engaged in distance education. He felt the number of interested individuals would not overload the system, and he showed his low cost packet radio modem and portable computer and explained how schools avoided wiring costs by connecting to the outside world via radio.He said the edifice complex of most school boards would have to change if we are to become more competitive. We have to put more into remote learning equipment and networks and less into buildings.

Mike Roberts of EDUCOM believed our job was to help Gordon make a clear and powerful case to Congress because "The gutters of Washington are littered with good ideas." He and others pointed out that many of the non-traditional groups wanting access to the Net could buy access today through regional networks.

Charles McClure of Syracuse University School of Information Science, explained some of the problems with the network infrastructure: lack of training manuals about the Internet, no formal mechanism for education. Most of the scientists in his study of network usage said they learned to use them by "gutting it out." He said our real challenge in the report is to explain the public good that will result from financing the NREN.

I suggested that the federal government could not guarantee equal access to the whole network but could promote the equal access to federal government information in electronic form by subsidizing depository libraries. Erik Fair, Apple Engineering Computer Operations, also commented that more federal information should be in electronic format.

George Johnston is an MIT physics professor who uses his Macintosh and modem to teach chaos theory to gifted high school students in rural Montana, Colorado, and Wyoming, using a chain of BBS's and the Internet. He spoke passionately about the need to train our workforce. This made a strong case for extending access to future researchers as well as the few established ones. Many of us felt that there were undiscovered Steve Wozniaks and Bill Gateses and that access to the Internet would help more emerge,

strengthen our country, and continue the tradition of access of information and resources that has served our country so well in the past.

Mary Verona, a high school math teacher from Montgomery County, Maryland, won free access to a supercomputer for her class. She said there were too few universities opening up to the schools and two few high school teachers learning about this network environment.

Most of us felt that a high capacity (one gigabit per second) network could provide bursts on clear channels for weather researchers and other high-end visualization applications while also allowing the email users, the people making file transfers and remote logins to slip in and not conflict with the other, wide bandwidth uses.

I predicted that individuals would be exchanging digitized video clips on the Internet by the end of 1991 and this would eventually affect the network traffic and make us redefine what we mean by a low-end user. As the highways widen, the tools will improve, and many will begin using more bandwidth. Apple would try and provide tools to make access easier, and to help network users find the information they need with a minimum of difficulty.

Cliff Lynch, University of California Division of Library Automation, said there was not enough useful information at present for the high school student or member of the public. They could see millions of book titles and periodicals, but could not borrow them. There needs to be improvements in the interfaces, the protocols, and information directories need to be established to organize information about available services on the Internet and the future NREN.

Carol Henderson of the American Library Association said the multiplicity of federal programs should be used to push equal access to a 50 state backbone.

By the end of the day we had raised many issues but had not discussed many others such as the widening gap between academic and public library services, scholarly publishing in an electronic environment, and what sort of prototypes could be encouraged, and how they might be scaled up. Lynch seemed to have a good grasp of these problems as well as some of the more technical issues that might help resolve a few of them.

As we adjourned Gordon Cook looked haggard, and we all realized what a difficult job it will be for him to synthesize the notes and the statements and make a series of cogent arguments to persuade Congress to move on this issue.

Those of you who have comments may contact me at sac@apple.com, 408 974 3258, or CISLER1 on AppleLink. I

will convey them to the others participating in the electronic computer conference on these topics. These views represent my own opinions and may or may not be held by others at Apple or in the greater library community.

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